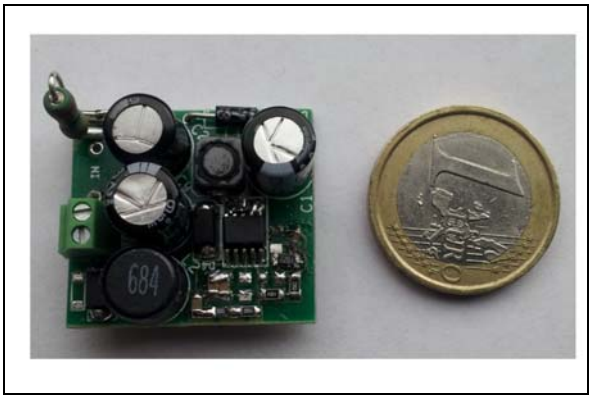
STEVAL-ISA114V1

5 V/0.8 W wide-range 30 kHz buck converter based on the VIPer06XS

Data brief



Features

- Universal input mains range:
  - input voltage: 90 - 264 V_{AC}
  - frequency: 45 - 65 Hz
- Single-output voltage:
  - 5 V @ 0.16 A continuous operation
- Fully protected against faults (overload, feedback disconnection and overheating)
- EMI: according to EN55022-Class-B

Description

This document describes a 5 V- 0.15 A power supply set in buck topology with the VIPer06XS, a new off-line high voltage converter by STMicroelectronics, specifically developed for non-isolated SMPS.

The features of the device include an 800 V avalanche rugged power section, PWM operation at 30 kHz with frequency jittering for lower EMI, limiting current with adjustable set point, on-board soft-start, safe auto-restart after a fault condition and low standby power consumption.

The available protection includes a thermal shutdown with hysteresis, delayed overload protection and open loop failure protection. All protection is auto-restart mode.

1 Adapter features

The electrical specifications are given in *Table 1*, the schematic in *Figure 1*, and the bill of material in *Table 2*.

Table 1. Electrical specifications

Parameter	Symbol	Value
Input voltage range	V_{IN}	[80 V_{AC}; 265 V_{AC}]
Output voltage	V_{OUT}	5 V
Max. output current	I_{OUT}	0.16 A
Precision of output regulation	ΔV_{OUT_LF}	±5%
High frequency output voltage ripple	ΔV_{OUT_HF}	50 mV
Max. ambient operating temperature	T_{AMB}	60 ºC

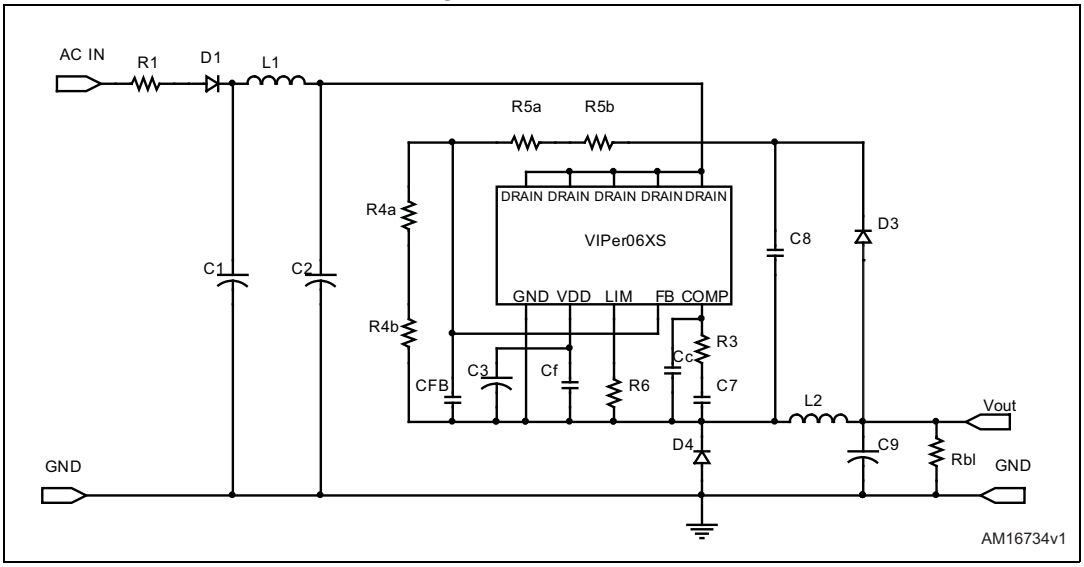
Table 2. Bill of material

Name	Value	Description	Footprint	Manufacturer
C1	2.2 µF, 400 V	Electrolytic capacitor		Saxon
C2	2.2 µF, 400 V	Electrolytic capacitor		Saxon
C3	2.2 µF, 25 V	Ceramic capacitor	SMD: 0805	Murata
CFB	Not mounted	Ceramic capacitor	SMD: 0805	
Cf	100 nF, 50 V	Ceramic capacitor	SMD: 0805	Murata
Cc	Not mounted	Ceramic capacitor	SMD: 0805	
C7	22 nF, 25 V	Ceramic capacitor	SMD: 0805	Murata
C8	100 nF, 50 V	Ceramic capacitor	SMD: 0805	Murata
C9	100 µF, 25V	Electrolytic capacitor		Rubycon, ZL series
D1	1N4007	High voltage rectifier	DO-41	Fairchild
D3	STTH1L06	High voltage ultra fast rectifier	SMB (SOD87)	ST
D4	STTH1L06	High voltage ultra fast rectifier	SMB (SOD87)	ST
Daux	Not mounted	Small signal diode		
IC	VIPER06XS	High voltage converter	SSO-10	ST
L1	1 mH	Input filter inductor	SMD	Epcos
L2	RFB0810-681	0.68 mH power inductor		Coilcraft
R1	22 ohm	1 W resistor		Panasonic
R3	1 kohm, 1%	1/4 W resistor	SMD: 0805	Panasonic

Table 2. Bill of material (continued)

Name	Value	Description	Footprint	Manufacturer
R4a	1.5 kohm, 1%	1/4 W resistor	SMD: 0805	Panasonic
R4b	22 kohm	1/4 W resistor	SMD: 0805	
R5a	15 kohm	1/4 W resistor	SMD: 0805	
R5b	0 ohm, 1%	1/4 W resistor	SMD: 0805	Panasonic
R6	Not mounted	1/4 W resistor	SMD: 0805	
Rbl	10 kohm, 1%	1/4 W resistor	SMD: 0805	Panasonic

Figure 1. Schematic



2 Layout

Figure 2. Layout (top)

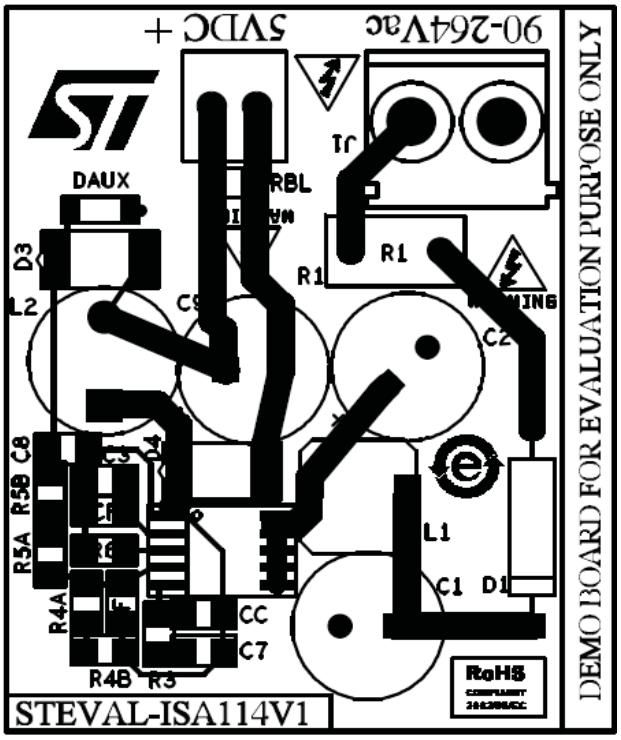


Figure 3. Layout (bottom)

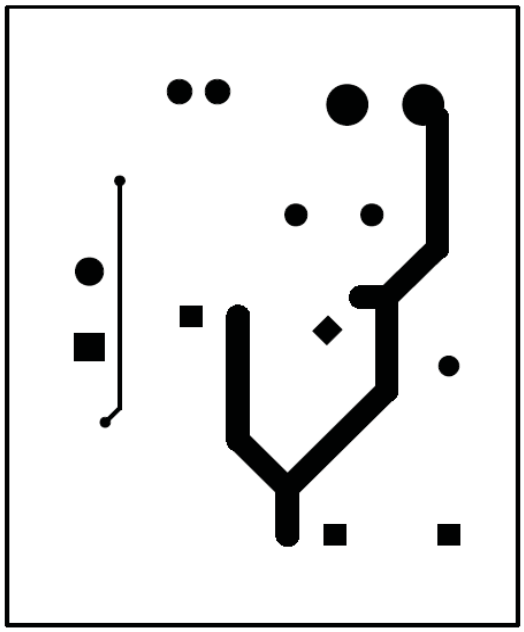


Figure 4. Thermal measurement @ V_{IN} = 80 V_{AC}, full load (170 mA), 3.3 kohm bleeder

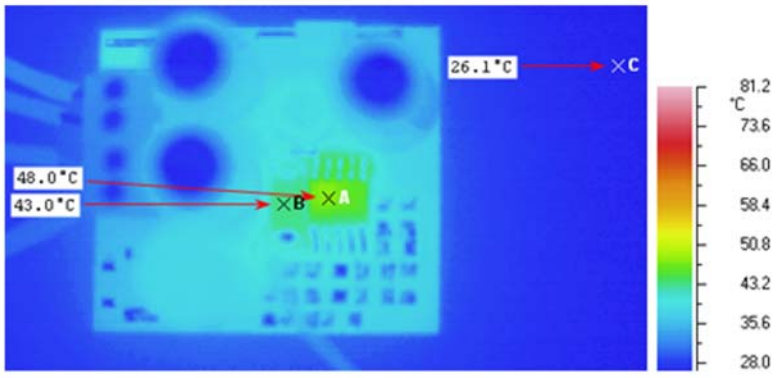


Figure 5. Thermal measurement @ V_{IN} = 115 V_{AC}, full load (170 mA) 3.3 kohm bleeder

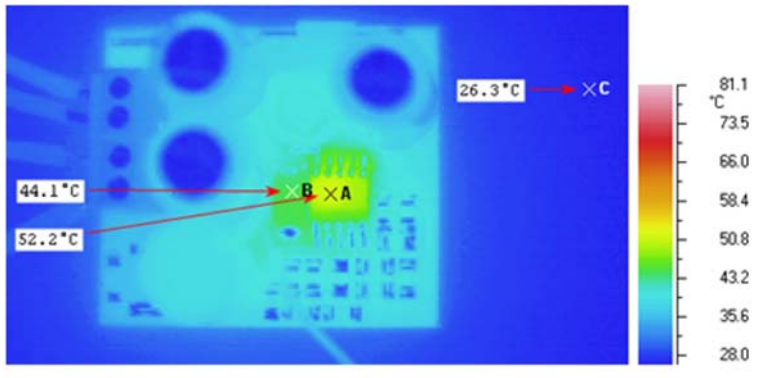


Figure 6. Thermal measurement @ V_{IN} = 230 V_{AC}, full load (170 mA) 3.3 kohm bleeder

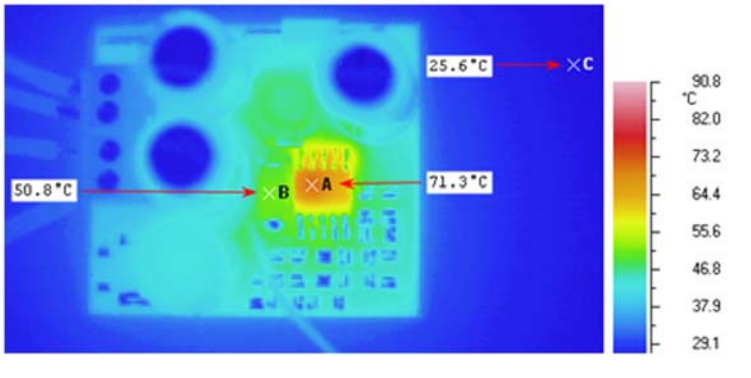
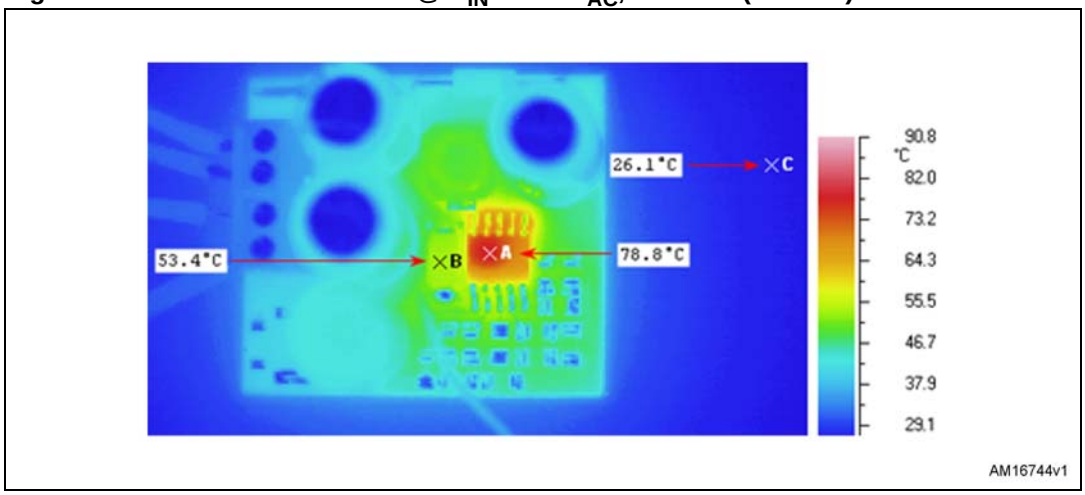


Figure 7. Thermal measurement @ V_{IN} = 265 V_{AC}, full load (170 mA) 3.3 kohm bleeder



3 Revision history

Table 3. Document revision history

Date	Revision	Changes
24-Jul-2013	1	Initial release.